AUTOMATIC SEATING ARRANGEMENT SYSTEM USING TABU SEARCH ALGORITHM

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ABSTRACT

Automatic seating arrangement is a way of conducting examination with little or no stress for either the students or the invigilators. This research aimed at developing a system for the Federal Polytechnic Ilaro, to simplify the problem of allocating and seating arrangement for students. The system allocates invigilator to a particular hall and generate seat for students based on their departments and matriculation numbers. The system was implemented using initial solution, the neighborhood exploration and the termination criteria which involve the registration /allocation, log-in and questionnaire pages. Programming languages such as SQL, PHP, HTML and CSS were all incorporated into the main function of the algorithm, the output web page was developed using LARAVEL – a framework of PHP programming language. The system showed clearly an efficient and faster approach to management of seats and examination halls as well as minimizing the occurrence of seat redundancy in the examination hall with avoidance of duplication of student or staff record pertaining to examination. The system is therefore recommended for use at the Federal Polytechnic, Ilaro since the database was populated with records of students and staff of the institution meanwhile an adaptation to any other institution is possible.

Keywords: Initial Solution, Neighborhood Exploration, Termination Criteria, Seating Arrangement.

INTRODUCTION

An automatic seating plan is a diagram or a set of written or spoken instructions that determines where people should take their seats. It is widely used on diverse occasions. Seating plans have a wide range of purposes. At formal dinners, they are used to avoid chaos and confusion upon entrance and to follow the etiquette.
Bougie, (2012) defines space allocation as a process of allocating rooms or areas of space for specific functionality. Thus, since it is limited, it must be well managed by the faculties towards availability and suitable with the user required.

The existing manual system has flaws and loopholes that are yet to be corrected, such as disorderliness and chaos, which also barred the system from being a typical recommendation for public or general use. Furthermore, an individual or candidate that has been scheduled for an examination, whom eventually found himself/ herself in such state of chaos and confusion, may end up wasting precious time while trying to locate the examination hall and also the seat number that been allocated to him or her, this problem in particular is a very common problem that has been observed in the current system. In addition to this, redundancy is very much inevitable in the existing system, there have been cases or scenarios where seats are left vacant without any individual or candidate occupying the space, the occurrence of these redundancies has been as a result of circumstances that are considered unforeseen. This is also a major problem in the system that needs to be tackled in order to make the system absolutely suitable for use. Tabu search algorithm is proposed to solve these problems.

Tabu search is a meta-heuristic technique that guides a local heuristic search procedure to explore the solution space beyond local optimality. One of the main features of Tabu search Algorithms is the memory adaptability, which creates more flexible search behaviours. This is the hallmark of Tabu search approaches. A novel finding is that such principles that are sometimes sufficiently potent to yield effective problem solving behavior in their own right, with negligible reliance on memory. Over a wide range of problem settings, however, strategic use of memory can make dramatic differences in the ability to solve problems. Pure and hybrid Tabu Search approaches have set new records in finding better solutions to problems in production planning and scheduling, resource allocation, network design, routing, financial analysis, telecommunications, portfolio planning, supply chain management, agent-based modeling, business process design, forecasting, machine learning, data mining, bio-computation, molecular design, forest management and resource planning, among many other areas
According to Aashti, (2016) Automatic seating arrangement tool for examinations in universities/colleges was dedicated to simplifying the task of manually seating students in an examination hall. The tool provides an effective measure to dynamically place students in an examination hall just by providing the number of rooms available. This system was implemented with C-Programming language. The aim of the paper is to describe the working of the software and how it is used to lessen the mammoth task of manually allocating seats during an examination.

The objectives of this research is to develop a system that assist students of the institution to locate their Examination Hall and seat at any point effectively without wasting their precious time, and eliminate occurrence of seat redundancy.

Alvarez-Valdes, et al., (2002) used a set of heuristic algorithms in a program for solving course timetabling related problems. A Tabu Search procedure had several strategies developed for it and tested, leading to a potent and quick algorithm which produced satisfactory results.

Werra (1995) employed two-execution phase in the attempt to minimize searching difficulties. Problems are broken into sub problems of weekly and daily. In the first phase, subjects will be predetermined for its days and the second phase will allocate time for the selected days. If the situation cannot be resolved, the first phase will be repeated and a different day will be selected. Priority is given to a time and selection of time slotting activity for allocating a reasonable time slot.

Thompson and Dowsland (1996), Hertz (1991) proposed Tabu Search as an approach to solving Examinations Timetabling Problem (ETP). Though the Tabu Search approach is similar to the one used in this project, hard and soft constraints were not differentiated in previous works.

The scope of the project is targeted to the designing of a web interface and database that will store or keep records of students and automatically allocate each student to seat and it will be given to the Institution for immediate or future use.

Producing a computerized system that addresses the issues of examination seating arrangement for student, as well as documentation of all their records in tertiary institution will provide easy allocation of exam seat/hall for student during their exam period and also reduces examination center tension in the sense that each student need to come down to school/ departmental notice board before they will be able to know their real examination hall and until they got there before they will also know the seat(s) they fall into. This system will aid the management in improving on the examination system and also ease and improve the entire operations of the institution.

METHODOLOGY
The major specification in this design allows the system to capture data related to both students and Staff as input. The design has two major modules. A module is dedicated to administrator while the other is for Students activities.
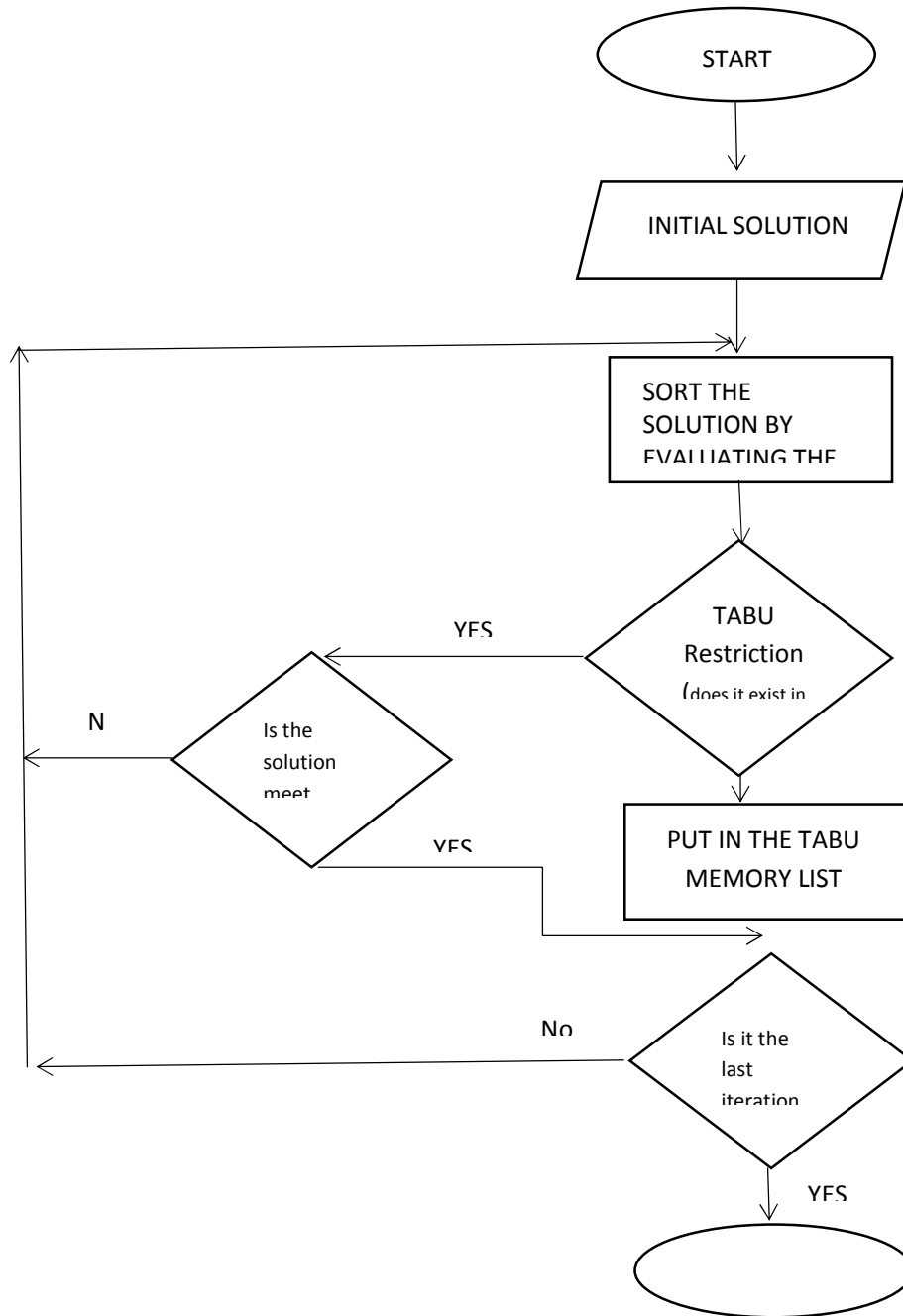
Procedure for Student's Activities
- Students will log-in into the system
- They will register for seat allocation
- Then later check for seat number
- Also, they can change their password from this module

Procedure for Administrator
- Administration log-in can be effected in this module
- Staff records can be stored and searched from here
- Students records also can be searched from this module
- Admin will proceed to generate seating arrangement

Algorithm Flowchart

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The figure above explain TABU SEARCH ALGORITH
IMPLEMENTATION

RESULT AND DISCUSSION

STOP

The output of the system has to do with output of some operation carried out by the student. As s
output described the output of the new design system which its procedure based on different area.

Fig. 9: Home page

The home page shows the default page of the design. The home page consists of options that allow the student, staff and admin to gain access to the system through a means of authentication. It also consists of an about menu that displays a brief description of the system.
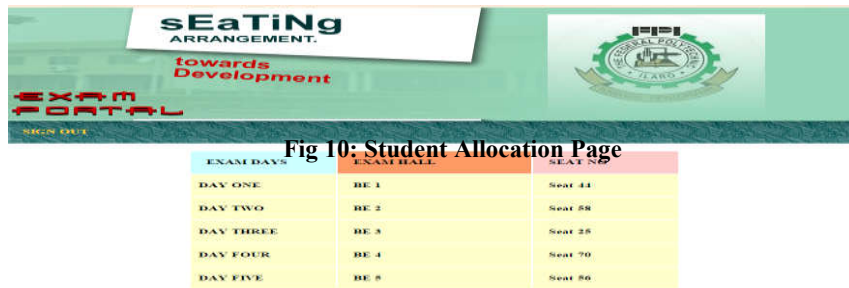
Fig 10: Student Allocation Page

EXAM DAYS	EXAM HALL	SEAT NO
DAY ONE	BE 1	Seat 44
DAY TWO	BE 2	Seat 58
DAY THREE	BE 3	Seat 25
DAY FOUR	BE 4	Seat 70
DAY FIVE	BE 5	Seat 86

This page gives a detailed report on the allocation of students based on the examination days, the halls for each of the days and also the seat number for each hall that is being allocated to the student.

Fig 11: Student Password Reset Page

STUDENT HOME PAGE

Your password has reset successfully

| * MATRIC NUMBER | ENTER MATRIC NO |
| * NEW PASSWORD | ENTER NEW PASSWORD |

RESET

This page gives a report or feedback showing that a password reset was successful when a student attempts a password reset.

Fig 12: Student successful registration report page

This page gives a feedback on a successful registration, after a student has entered the correct details on the registration form provided.
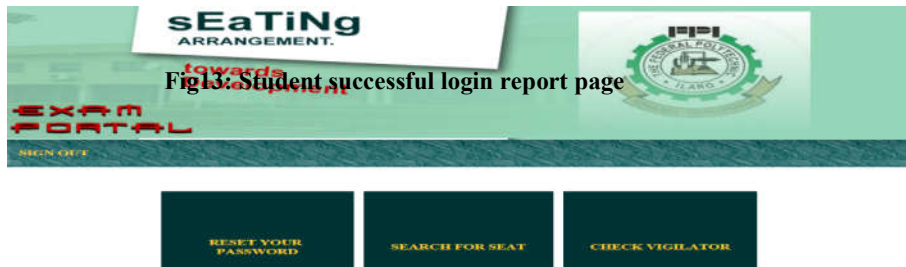
Fig13: Student successful login report page

This page shows that a student has successfully logged in to the system using the correct username and password. On this page, the student can reset password, search for seats and also check for invigilators.

DATABASE DESIGN

The design of the database was done with MySQL database. During the design, the following consideration was done, the total number of tables that would be required to store all the tabular data. The table again is designed considering the data items to be stored, with respect to their field names.

Table 1: Overview of the Database Design

This interface gives an overview on how the structure and design of the database looks like. The database design facilitates the storage of all the records of students that has been registered.

Table 2: HND2 Allocation Table

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This interface shows a table that captures all the hnd2 students that has been allocated successfully.

Table 3: HND1 Allocation Table

This interface shows a table that captures all the hnd1 students that has been allocated successfully.

CONCLUSION

A web based interface for showing hall name and seat number for student was developed, which makes students to see their seat in respective hall with ease. Using PHP, insert the timetable by entering the time and date for the particular paper and create the seating arrangement. Also, database of the exam timetable can be entered by student to view their halls and timing of the examination. Through internet, automatically, timetable is shown at the database and seating is also created according to the particular day and semester. Username and password is created for unique user by registering their details in register module, and they can change it by the permission of admin only

RECOMMENDATION

The system is recommended for use at all levels of the National and Higher National Diploma Programmes of the Institution due to its workability for particular classes (HND 1& 2) to capture all the courses taken at first and second semesters of the session.

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